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AT BE CH DE ES FR GB GR IT LI LU NL(71) Applicant: Horda Gummifabrik AB  
Horda  
S-330 17 Rydaholm(SE)(72) Inventor: Söderberg, Valter  
Torngatan 12  
S-334 00 Anderstorp(SE)(74) Representative: Barnleske, Hans Wolfgang  
c/o H.W. Barnleske Patentbyrå AB P.O. Box 25  
Turingegatan 26  
S-151 21 Södertälje 1(SE)

(64) Exhalation valve device for protective face mask.

(67) The present invention relates to an exhalation valve device for use in protective masks, comprising a neck portion (2) for sealing connection to the protective mask, and a valve portion (3) connected to the neck portion, said valve portion having at least one valve member permitting the passage of exhaled air, with substantially no change of direction.

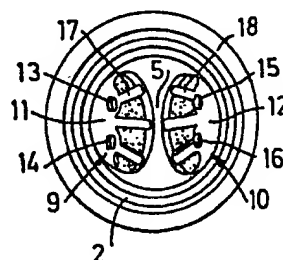


FIG.2

EP 0 252 891 A1

The present invention relates to an exhalation valve device for use in protective masks.

In protective masks of the type completely covering the wearer's face, it is already known to use an  
5 exhalation valve consisting of a seat and a centrally secured rubber membrane, i.e. disc valves. There are several drawbacks with this type of valve. During exhalation the air flows around the valve membrane thus causing speech to be muffled and distorted. This  
10 type of valve also gives rise to relatively high exhalation resistance and extra force is required initially to open the valve.

The object of the present invention is to eliminate the drawbacks of this known valve and instead provide  
15 an exhalation valve means for protective masks which has low breathing resistance, opens and closes quickly and causes the least possible distortion of speech.

This is achieved by means of the exhalation valve according to the present invention comprising a neck  
20 portion for sealing connection to the protective mask, and a valve portion connected to the neck portion, said valve portion having at least one valve member permitting the passage of exhaled air, with substantially no change of direction. This gives considerably en-  
25 hanced reproduction of speech in comparison with known exhalation valves.

According to a preferred embodiment of the invention, the valve member consists of a valve seat having a  
through-flow opening, a border surrounding the opening,  
30 an attachment portion for a valve membrane, and a valve membrane cooperating with said valve seat, the membrane

in closed position sealing against the border of the valve seat, the attachment portion of the valve seat being formed in conjunction with the border, and wherein the valve membrane is joined at an edge  
5 portion to the attachment portion, and also wherein the valve seat is arranged at an angle to the flow direction of the enhaled air, with the attachment portion applied nearest to the neck portion.

10 This arrangement of the valve offers extremely low exhalation resistance since the force required to open the valve membrane on the side opposite the attachment portion is slight - several times less than the force required to open a valve membrane of equivalent size which is centrally attached.

15 The function is additionally improved by arranging two valve members in the valve portion. In this case the exhalation valve device is preferably provided with two walls converging towards each other and at least partially flat, each having a valve member  
20 in the flat portion.

To prevent the valve member from coming into contact with contaminated air, an air column should be provided between valve and surrounding atmosphere. This can of course be achieved by conventional means in the form  
25 of a part provided with a flow channel and arranged outside the exhalation valve with the valve member.

According to one embodiment of the invention a speech amplifier, also known as a speaker may be used to create the air column. The speaker is suitably designed  
30 to be applied over the exhalation valve device and

to be connected to the protective mask in one step together with the exhalation valve device.

5 The exhalation valve device and the speaker, if any, may be shaped with a circular neck portion and is/are thus connected to the protective mask by passing the part of the protective mask which surrounds the connection opening, over said neck portion and clamping it with a clamp means.

10 Further advantages and characteristics of the invention will be revealed in the following detailed description, with reference to the accompanying drawings in which

Figure 1 shows a perspective view of an exhalation valve device according to the present invention,

15 Figure 2 shows a view of the inlet end of the exhalation valve device, and

Figures 3a - 3b show perspective views of a speaker adapted for use with the invention.

20 Figure 1 shows a perspective view of an exhalation valve device according to the present invention, designated 1. The device comprises a neck portion 2 and a valve portion 3. The neck portion is preferably circular and may be provided with a collar-like exterior 4, as shown in the drawings, to allow simple, sealing connection to a protective mask and/or an inner mask. The walls of the  
25 valve portion 3 extend to a point 5, two flat wall sections located opposite each other converging towards each other and being formed as valve seats. In each of the valve seats is a membrane 6 of elastomeric material  
30 which in closed position is in contact around its entire

periphery with the border, not shown in detail, of the valve seat. The attachment portion 7 of the membrane and the bevelled edge 8 have increased material thickness, thus improving abutment. The valve membrane 6 is  
5 secured in the valve seat by the edge located nearest to the inlet and for exhaled air and its active part is thus furthest from the inlet opening, i.e. the neck portion 2.

Figure 2 shows the valve device seen through the neck  
10 portion. The two valve seats are designated 9 and 10 and are provided nearest the neck portion with attachment portions having openings for insertion of attachment studs arranged on the valve membrane. Said attachment studs are preferably provided with upsets which are  
15 passed through the openings so that, due to the inherent elasticity of the material, the membranes are held in sealing contact with respective attachment portions. Said upsets are designed 13, 14, 15 and 16 in the drawings. The valve seats are also provided with support  
20 ribs 17 and 18, reinforcing the valve seats and preventing the valve membranes from being drawn through the seats. As can be seen in the drawings, the support ribs are preferably arranged furthest apart at the edge opposite the attachment portion, i.e. where the  
25 exhaled air passes, at least during the initial opening stage.

Figure 2 thus illustrates the essence of the invention: that the exhaled air can pass straight through the exhalation valve device with the least possible voice  
30 distortion. The valve arrangement also offers minimal opening resistance.

5 Naturally the valve membrane may be attached in any suitable manner and only one of several feasible arrangements is shown in the drawings. The attachment portions on the valve seats might, for instance, be in the form of studs to fit corresponding openings in the valve membranes.

10 Figure 3a shows a speaker 19 intended to be fitted over the exhalation valve device according to the invention and, together with this, to be connected in sealing manner to the protective mask. The speaker comprises an area 20 to hold the exhalation valve device.

15 Figure 3b shows the speaker seen from the opposite side, i.e. the outlet side. The speaker cover 21 is designed, together with the valve space 20, to form an annular column opening at the bottom of the cover 21. This column forms an air column or "buffer" which prevents the valve device from coming into contact with contaminated air. The use of said speaker together with the exhalation valve device according to the invention  
20 further enhances the advantages of the device according to the invention and extremely good voice reproduction is achieved.

C l a i m s

1. An exhalation valve device for use in protective masks, c o m p r i s i n g a neck portion (2) for sealing connection to the protective mask, and a valve portion (3) connected to the neck portion, said valve  
5 portion having at least one valve member permitting the passage of exhaled air, with substantially no change of direction.
2. An exhalation valve device as claimed in claim 1, w h e r e i n the valve member consists of a valve  
10 seat (9, 10) having at least one through-flow opening, a border surrounding the opening, an attachment portion (11, 12) for a valve membrane, and a valve membrane (6) of elastomeric material cooperating with said valve seat, the membrane in closed position sealing against the  
15 border of the valve seat (9, 10), the attachment portion (11, 12) of the valve seat being formed in conjunction with the border, and wherein the valve membrane is joined at an edge portion to the attachment portion, and also wherein the valve seat is arranged at an angle to  
20 the flow direction of the exhaled air, with the attachment portion applied nearest to the neck portion (2).
3. An exhalation valve device as claimed in claims 1 - 2, c o m p r i s i n g two valve members.
4. A device as claimed in claims 1 - 3, w h e r e i n  
25 the valve portion is provided with two walls located opposite each other, converging towards each other and at least partially flat, containing the valve seats (9, 10).

5. A device as claimed in claims 1 - 4, c o m p -  
r i s i n g a means for creating an air column be-  
tween the exhalation valve device (1) and the surrounding  
atmosphere.
- 5 6. A device as claimed in claim 5, w h e r e i n  
the means creating the air column consists of a speech  
amplifier in the form of a speaker (19).



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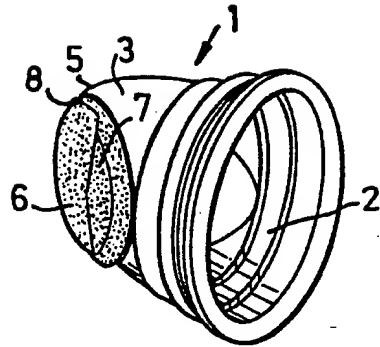


FIG. 1

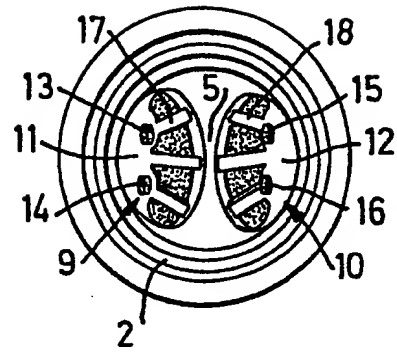


FIG. 2

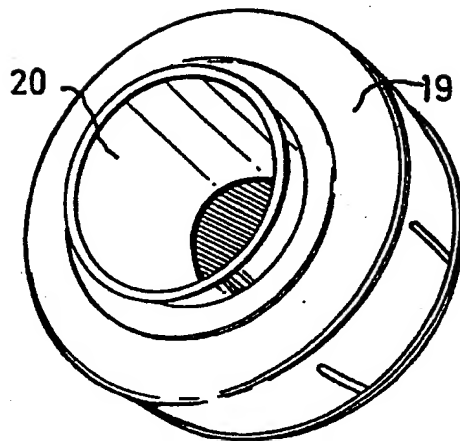


FIG. 3a

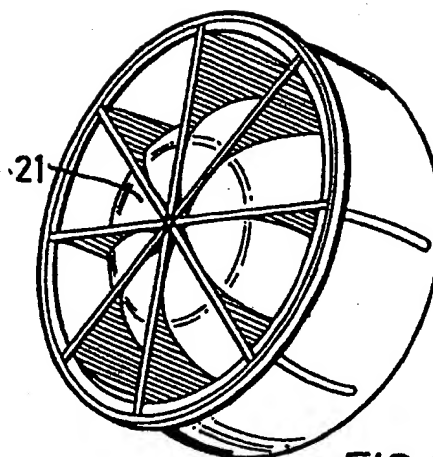


FIG. 3b



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# EUROPEAN SEARCH REPORT

0252891

Application number

EP 87 85 0216

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-1 853 373 (MONRO) * Page 1, line 90 - page 2, line 3; figure 2 *	1	A 62 B 18/10
Y		2,3,4	
Y	FR-A-2 367 968 (MOTOBECANE) * Page 2, line 26 - page 3, line 6; figures 1,2 *	2,3,4	
A	GB-A- 660 095 (CHARBONNEL) * Page 1, line 90 - page 2, line 37; figure 1 *	5,6	
A	DE-C- 738 391 (MEINKE) * Pages 1,2; figure *	1-3	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	US-A-1 326 966 (REEVES)		A 62 B F 16 K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-10-1987	Examiner WOHLRAPP R.G.
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>			